

EFFECTS OF DANCE-BASED MOVEMENT THERAPY ON BALANCE AND PREVENTING FALL IN CEREBELLAR ATAXIA: A CASE STUDY

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ABSTRACT

Background: Individuals with cerebellar ataxia in its later stages frequently have major balance and immobility issues. There are currently no effective rehabilitation programmes for people with cerebellar ataxia that can assist them improve their motor impairment.

Objective of the study:

- To determine the efficacy of dance-based movement therapy on balance in subjects with cerebellar ataxia, as well as to determine the effects of dance-based movement therapy on preventing falls in cerebellar ataxia subjects.
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Design and setting: The study was conducted in Saveetha Physiotherapy OPDSaveetha Medical College and Hospital, and the study type was single case study.

Result: The findings of the study show that after completing the intervention, there are improvements in independent standing balance as well as self-reported sadness and quality of life ratings.

Conclusion: The study concluded that movement therapy based on dance improves balance and prevents falls in people with cerebellar ataxia.

Keywords: cerebellar ataxia, dance-based movement therapy, balance, fall.

INTRODUCTION:

Cerebellar ataxia is a disorder that affects the cerebellum. Cerebellar damage, its afferent and efferent connections causes this symptom. It may be the result of a variety of factors like lesions in the cerebellum or localised degenerative disorders (e.g., stroke and benign tumour). The motor control of individuals with cerebellar ataxia typically deteriorates, affecting their body balance and limb coordination. These motor symptoms worsen with time in cerebellar ataxia degenerating due to the disease's progressive nature. As a result of their immobility, at the end stages of the disease, patients are frequently confined to a wheelchair or a bed. patients in the later stages of the disease are frequently adhered to a wheelchair or bed.¹

Patients' freedom, everyday activities, and quality of life are frequently impacted by motor disability (QOL).² There have been no medical management available to cure or change the condition at this time. Physiotherapeutic therapies can assist persons with cerebellar ataxia restore their motor function, according to recent studies on the creation of successful therapeutic procedures³ For example, Graded exercise-mediated trainings are effective in decrease cerebellar ataxia-related motor dysfunction, according to research concentrating on ataxic balance and gait abnormalities.⁴

Physiotherapeutic interventions, on the other hand, appear to be useful for non ambulatory persons with extreme cerebellar ataxia. There has been little research into rehabilitative programmes for patients with significant cerebellar ataxia. Persons with cerebellar ataxia have benefited from locomotion therapy on a treadmill with a BWS system.⁵

This piece of training equipment is designed for repeating stepping exercises that require less postural control, however, using a harness in BW suspension and support should be utilised with caution since it may block the development of locomotion's balance component⁶. As a result, it may be ineffective for persons who have balance issues (i.e., such as those suffering from cerebellar ataxia)⁷ discovered that using interactive virtual video games in severe progressive ataxia could help with gait, posture, and balance control in standing and sitting.

This training technique makes it easier to undertake balance exercises and whole-body coordination activities at home with more enjoyment. Furthermore, the advantages of training boost motivation and training. The adoption of compensatory strategies by the performance during the task must be taken into consideration. When patients acquire maladaptive control mechanisms, these compensatory techniques might obstruct the rehabilitation of movement

patterns and limit their potential. Under the supervision of physiotherapists, relevant instructions and guidance should be given during video game-based intervention.⁸

When choosing the most effective therapy programs for a certain form of movement-related functional deficiencies in advanced cerebellar ataxia, a training programme for cerebellar ataxia could be dance-based movement's therapy or dance. Step-by-step management of goal-directed motions is related to coordination functions and balancing in dance-based movement.⁹ Because of severity of the individual's balance and postural impairment in cerebellar ataxia, paired dancing can help them operate more comfortably and test their limits of stability throughout training. It also provides physical assistance and guidance.¹⁰

The person can receive personal supervision and guidance about the needed gait kinematics and posture when paired with a trainee or therapist. Additionally, the therapist can alter the amount of hand-held assistance provided hence the person's dependency-producing effect as a supporting aid is lessened when necessary. Incorporating music into a dance programme, as well as having access to social connection (example peer support & collaboration), may enhance not only the patient's physical state and mobility, but also his or her psychological response and quality of life.¹¹

Despite the reality that dance-based movements as a therapeutic communication may provide appropriate training parts to address the shortcomings in activities, no research have been carried to assess its possible treatment benefits for people with cerebellar ataxia, particularly those with extreme mobility and balance problems. The purpose of this research is to determine the effect of dance-based movements therapy on people with cerebellar ataxia maintain their balance and avoid falling.

METHODS :

Study design: Single case study.

Case description: A 59-year-old person living with his father and sister was the subject of the investigation (height: 175 cm, weight: 73 kg Spinocerebellar ataxia type 2 was his diagnosis (SCA 2) at the age of 58, which was verified by his neurologist through clinical examinations, MRI data, and genetic testing. He started having ataxic symptoms while he was in his early 50s, and they got worse over time. At the age of 56, he was wheelchair-bound due to deteriorated locomotor and posture functions, as well as poor limb coordination.

He had serious balance issues at the time of this case and was unable to stand on his own, requiring the assistance of two others to walk. To get around the house, he used grab bars mounted on the wall. He had never undergone any kind of rehabilitation before. The person took the Mini Mental State Examination to assess his cognitive status and received a normal score⁽²⁵⁾. The severity of his cerebellar symptoms was determined using the International Cooperative Ataxia Rating Scale (ICARS).¹²

The Ataxic Scale is a tool for diagnosing and evaluating ataxia (SARA).¹³ In fingertip chasing, nose-finger touch, quick alternating hand motion, and heel-shin slide tests, he

demonstrated issues with coordinated, as well as minimal dysarthria and written problems. He had no other orthopaedic, optical, or psychological problems, and no additional cerebellar complaints (such as weakness or tremors). Stretches, sit-ups, video games, and some housework all were part of daily routine while seated or reclined on the floor..

PROCEDURE:

A single case study was done in Saveetha physiotherapy OPD, Saveetha medical college and hospital, Thandalam, Chennai. A 59 years old male with cerebellar ataxia. The subject is evaluated by using functional reach test, berg balance scale measurements. The dance-based movement exercise was given for duration of 4 weeks, and it was given 3 days in a week. The functional reach test, berg balance scale was measured as a post-test measurement. The values were tabulated and analysed.

Berg Balance Scale: The patient is asked to transfer from sitting to standing, then stands without assistance, then sitting with backrests, then standing to sitting, and finally transfers and stands independently with closed eyes, then standing independently with narrow base, and then reaching the object with outstretched arm and in standing position asking them to pick up the object from the floor and in standing position asking them to turn complete three sixty degree and instruct him to keep his alternate foot on the steps while standing unsupported, then to stand in one leg without support, then to stand in single leg, and finally to record the results. The patient is instructed to raise the dominant arm 90 degrees and place it at shoulder level, extending as far forward as it can go without losing mobility or balance in the feet, and the distance is measured.

The dancing protocol intervention's basic steps and easiest movements were altered to suit cerebellar ataxia. With the support of one or two senior assistants, a trained dance instructor designed the dancing programme. The trainer is very knowledgeable about and has a lot of expertise with cerebellar ataxia mobility difficulties. The therapist acted as a dancing partner during the lesson, giving physical support and close observation. The person began by practising balance and stability while standing up straight with the help of a companion. The man was told to have a solid posture while standing straight and equally distributing his body weight between both feet. He was instructed to transfer their weight lateral onto another leg while maintaining an erect posture with his trunk and limbs. The practise was performed on the second leg after obtaining proper weight bearing and balancing on the first. After completing the side-by-side weight transfer task, the participant performed a mid-stance body weight shift (i.e., one leg in front and the other leg behind it). The instructor observed and guided the individual's attention during the static balance tasks in order to control the placement of his centre and posture. Following around twenty minutes of static balancing practise, the last half an hour of therapy were dedicated to fundamental step movements. The dance comprised multi-directional steps, spinning, and rock actions, with a focus on totally altering the centre of mass and maintaining balancing and posture alignments while shifting to a new basis of support, notably during the single-limb stance. The participant's partner guided the stepping movement as they were

performed slowly and frequently in a closed arm position, so that the person may establish a conscientious sense of good balance and postural control. Their movement sped up to match the song. In the event of spinal swaying or reduced of balance during practising, the restoration of body stabilising was priority over other activities. He required a room with a hard-covered floor due to his mobility and transit concerns (6 m x 4 m).

RESULT:

Table 1 shows the result of balance and fall prevention. Among the balance and fall prevention test, progression has been observed in the entire test.

DISCUSSION:

The benefits of dance therapy on balancing and fall avoidance in a patient with cerebellar ataxia were investigated in this study. After 4 weeks of one-hour part dance treatment three times a week, the person's independent standing balance improved. Furthermore, following the intervention, self-reported depression and QOL ratings both improved, indicating better psychological well-being. While the majority of the improvements in balancing capacities did not last past for one month, follow-up testing showed some improvements in mobility and mental health benefits did. The components of training used in the current intervention programme may be responsible for the therapeutic benefits of dancing on balance in people with progressive cerebellar ataxia. The inability to keep one's balance when standing is one of the most common symptoms of cerebellar ataxia. Dancers use weight shifting motions to improve their balance and posture during performing coordinated stepping patterns.¹⁴

Participants must maintain consistent balance and change their steps step by step while dancing. Dancing's qualities need a higher level of performance on functional and complicated tasks than therapeutic exercise sessions, and it may help to enhance a person's balance. Dance movement patterns have functional qualities that are more likely to meet that goal of physiotherapies for cerebellar ataxia treatment. There is substantial evidence in clinical practise that task-specific training is more beneficial to treatment outcomes than nonspecific rehabilitation training.¹⁵

The explicit technique was assumed in this study to aid patients in becoming conscious of their real state of movement and allowing them to change their behaviours as needed.¹⁶ reported that utilising such a therapy technique could be advantageous for sensory learning in people with cerebellar disorders, which supports this theory. Third, in the treatment of persons with ataxia, the role of the partners may be critical. Second, the participant received explicit feedback and physical training to improve the attention to movement attributes and perform training. In persons with cerebellar dysfunction, implicit learning and motor skill automaticity are known to be impaired.¹⁷

The partner also analysed and taught appropriate trunk alignments and weight shift with limbs kinematic during the intervention. A one instruction and monitoring by a human may help to avoid compensatory or erroneous movement habits from developing. The companion decreased the amount of personal help as the training continued in order to increase independence balance and mobility while diminishing the companion's dependency-producing effects. The researchers hypothesised that the dance program's training elements and strategies would help patients with ataxia improve their balance and avoid falling. However, these improvements in motor skills did not endure once the intervention programme stopped, and they recovered to near-baseline levels. The exact cause of this loss of functional capacity is unknown, but we assume it is mostly due to natural sickness progression and a lack of physical exercise at home as a result of the treatment. According to studies on the natural path of degenerative cerebellar disorders, individuals having cerebellar ataxia type 3 whom didn't receive any treatment had a mean yearly growth of 1.61 SARA points.¹⁸ Training-induced function gains were shown to be shorter-lived in those with progressive neurological degeneration in cerebellum.

Adding on, following the intervention period, the individual reported a significant decrease in physical activity at home. When the treatment was discontinued, he reported feeling slightly depressed and less likely to engage in physical activity. As a result, ongoing rehabilitation therapy appears to be essential for patients with cerebellar ataxia to maintain their physiotherapeutic benefits. The person's sadness and life quality were enhanced as a result of the dancing intervention. Dance programmes have also been reported to increase psychological well-being in patients with neurological conditions like stroke and Parkinson's disease.¹⁹

Depression, which is considered to be a common co-morbidity in cerebellar ataxia patients, and it's assumed that the severity of the disease is linked to a more risk of depression.²⁰ It's also thought to affect patients' perceptions of their functional status and quality of life. Dance-based treatment has already been demonstrated to be particularly beneficial to mental health.²¹ due to the dancing program's inherent social and supporting aspect, and even the projected physical mobility and balancing benefits Even in the latter stages of cerebellar degeneration, the 4-week dancing instruction had a good and long-lasting influence on the person's QOL, according to the current study. In informal exit interviews, the participant expressed satisfaction and a want to continue the training, which could indicate a lifetime commitment to the programme.

CONCLUSION:

The current study concludes that movement therapy based on dance has beneficial effect on balance and reducing falls in a person with cerebellar ataxia. Despite the fact that this study's findings are limited to a single individual, according to the Berg balance scale, pre-training 6/56, post-training 8/56, follow-up 8.5/56, and change pre-post training 40. and fall efficacy 23/100, post-training 31/100, follow-up 32/100, and change pre-post training 36.4, Individuals with

decreased mobility caused to cerebellar dysfunction may find dance to be an appropriate alternate way of physiotherapeutic intervention..

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Table1 - Pre-test and post-test values of balance and fall prevention

Outcome measures	Pre-training	Post-training	Follow-up	Change (%) pre-post-training
Berg Balance Scale	6/56	8/56	8.5/56	40
Fall Efficacy	23/100	31/100	32/100	36.4